THE UNIVERSITY OF ALBERTA

COMPARISON OF WISC-R AND WAIS SCORES FOR 16 YEAR OLDS

by

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ABSTRACT

The present study was carried out to provide comparative information on WISC-R and WAIS scores for 16 year old students. A total of thirty high school students were administered both scales in counterbalanced order, and the results were analyzed using Pearson Product Moment correlations to determine the relationship between the corresponding subtest and I.Q. scores of both scales. In addition, a test for the equality of two correlation matrices was conducted to compare the within-test relationships of the two Scales; and finally a one-sample Hotelling T^2 test was applied to check for significant differences between the means of the WISC-R and the WAIS.

Significant correlations ($p < .01$) were found between all of the corresponding pairs of subtests excepting the Picture Completion subtests of both Scales ($p = .231$). Furthermore, no significant differences were found between corresponding within-Scale correlations on the WISC-R and WAIS. Finally, it was concluded that a significant difference existed between means on the WISC-R and WAIS when scores on the two Scales were viewed simultaneously. Those variables which contributed most to this difference included the following subtest and I.Q. scores: Information, Arithmetic, Similarities, Digit Span, Verbal I.Q. and Full Scale

I.Q. It was found that the WAIS elicited higher I.Q. scores than did the WISC-R.

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CHAPTER I

INTRODUCTION

Introduction to the Problem

When the Wechsler Intelligence Scale for Children (WISC) was published in 1949, it was intended for use with children who were in the age range 5 years, 0 months, 0 days (5-0-0) to 15 years, 11 months, 30 days (15-11-30). When the scale was revised in 1974 to produce the Wechsler Intelligence Scale for Children - Revised (WISC-R), one of the primary differences between it and the WISC was that it included in its age range children from the age 6 years, 0 months, 0 days (6-0-0) to persons of the age 16 years, 11 months, 30 days (16-11-30). The shift in the upper age range from the WISC to the WISC-R produced an overlap of one year (16-0-0 to 16-11-30) between the WISC-R and the Wechsler Adult Intelligence Scale (WAIS), which was developed in 1955, and whose age range extends from 16-0-0 through adulthood. This overlap may prove to be advantageous in circumstances in which test-retest measures are deemed appropriate (e.g., to determine whether growth occurred over a short period of time; or in the case of an invalid first administration of one of the scales).

At the time of writing, the only study discovered which compares WISC-R and WAIS scores was done by Wechsler (1974) on a sample of 40 children aged 16 years 11 months. Although he did not correlate the subtests of one scale with their corresponding subtests on the other scale, correlations were calculated between each of the subtests of the WISC-R and the Verbal intelligence quotient (VIQ), Performance intelligence quotient (PIQ), and Full Scale intelligence quotient (FSIQ) of the WAIS, as well as correlations between the VIQ, PIQ, and FSIQ of both scales. (The results of this study are reported in Chapter II.) WAIS I.Q.s were about six points higher. In summarizing these results, Wechsler (1974) stated that "Further investigations with larger samples are required before one can conclude that the WAIS does, in fact, yield higher I.Q.s than the WISC-R at age 16" (pp.50-51). The only guidance given to examiners by the test publishers with respect to which scale is more appropriate for individuals in the 16-0-0 to 16-11-30 age range is found in the WISC-R manual, where it is stated that ". . . the examiner should choose the Scale that is most appropriate for his purposes" (p. 53). This guidance, however, may not facilitate the examiners' choice until more information is made available concerning the possible advantages and disadvantages of both scales for the particular age group in question. Sattler (1974) states "it would be helpful to have studies that compare - for statistical,

clinical, and educational purposes - . . . the WISC-R and the WAIS in their overlapping age ranges, using samples of both normal and exceptional children" (p.525).

The present study was therefore undertaken to investigate the differences, if any, between WISC-R and WAIS scores. In addition to providing information to practicing psychologists concerning the comparability of the two tests, the results of this study could document the possible "growth in intelligence" of the 16 year old age group during the nineteen years between the norming of the WAIS (1955) and the WISC-R (1974).

Statement of the Problem

The primary concerns of this study were to determine whether the subtests of the WISC-R correlated highly with their corresponding subtests on the WAIS; whether the subtests of the WISC-R maintained the same relationships with each other as the subtests of the WAIS did within that scale; and whether the means of each subtest on the WISC-R differed significantly from the means of their corresponding subtests on the WAIS. Finally, this study will attempt to determine the relationships between the composite VIQs, PIQs, and FSIQs that are derived from both scales. The answers to the problems posed above should hopefully culminate in a definitive statement as to whether or not it would be reasonable to substitute the WISC-R for the WAIS, or vice versa,

in a testing situation involving a 16 year old examinee; and whether or not it would be reasonable to expect an accurate assessment in terms of similar standard score results when employing both tests - the WISC-R and the WAIS - in a test-retest situation involving a 16 year old examinee.

Purpose of the Study

In summary, the purpose of this study is an attempt to answer the following questions:

1. Is there a significant difference between the scaled scores achieved by 16 year old students on the WISC-R subtests and their scaled scores on the WAIS subtests?

2. Is there a significant difference between the Verbal I.Q.s, Performance I.Q.s and Full Scale I.Q.s obtained by 16 year old students on the WISC-R as opposed to their corresponding I.Q. scores on the WAIS?

3. To what degree are the scores of 16 year old students on the WISC-R and the WAIS related?

Description of the Instruments

The instruments being scrutinized in this study are the WISC-R and the WAIS. Both instruments are individually administered tests of intelligence which currently enjoy widespread usage by psychologists and educators in order to facilitate psychological and/or educational decisions with respect to clients or students.

While the WISC-R consists of twelve subtests and the WAIS of only eleven, two out of the twelve WISC-R subtests are optional and the WISC-R I.Q.s are calculated on the basis of five Verbal and five Performance subtests. The WAIS, on the other hand, utilizes one of the WISC-R's optional subtests, Digit Span, as a mandatory subtest included in the calculation of the Verbal I.Q., making the Full Scale I.Q. the result of six Verbal and five Performance subtests. Since the Digit Span subtest is mandatory on the WAIS, the present study has also incorporated the use of its counterpart on the WISC-R. The various subtests of the WISC-R and the WAIS are listed in Appendix A, as well as a brief description by the author of what they purport to measure, and whether they are included in the Verbal or Performance Scale of the test.

Limitations of the Study

The sample that was used in this study is comprised of 16 year old students in Edmonton and St. Albert, Alberta high schools. The total number of students used in this study is thirty, eleven of whom were referred for testing by their respective school counselors while the remaining nineteen were volunteers. This sample may not be typical of the population of 16 year old students in Canada or, for that matter, in Alberta. Although a repeated measures design was utilized in this study, accidental results may

have occurred due to the nature of the sample. It is for this reason that readers should exercise prudence when generalizing from the results obtained here.

Definition of Terms

For the purpose of this study, the following definition of intelligence was used:

Intelligence: Operationally defined, Intelligence is that construct which is measured by either the WISC-R or the WAIS.

CHAPTER II

REVIEW OF RELATED LITERATURE

In this chapter, recent research that is relevant to comparisons between (1) the WISC-R and other tests, (2) the WAIS and other tests, (3) the WAIS and the WISC, and (4) the WAIS and the WISC-R shall be reviewed.

WISC-R and other Tests

The WISC-R was standardized on 2200 children, aged 6½ to 16½ years, in the U.S. between December, 1971 and January, 1973. Using the 1970 Census data for six stratification variables, Wechsler (1974) specified each case in terms of "age, sex, race, geographic region, and occupational group of head of household" (p. 19). This sample was also limited to "normal" children. "Institutionalized mental defectives and children with severe emotional problems were not eligible" (p. 19).

A number of studies have been done to assess the comparability of the WISC-R to various other intelligence tests currently available for psychological use. Wechsler (1974) reports comparisons between the WISC-R and several other individual intelligence scales. Comparisons between the WISC-R VIQs, PIQs and FSIQs and the Stanford-Binet Intelli-

gence Scale yielded correlations of .71, .60, and .73 respectively. The means of the WISC-R Full Scale I.Q. and the Stanford-Binet I.Q., when analyzed, revealed small differences of about two points in favor of either test at various age levels. Correlations between the WISC-R and the Wechsler Pre-school and Primary Scale of Intelligence (WPPSI) for fifty 6 year olds were .73 for VIQs, .78 for PIQs, and .82 for FSIQs, with WPPSI I.Q.s about two points higher (p. 51).

Loewen (1975) compared the subtest and I.Q. means of the WISC-R with those of its predecessor, the WISC, and found no significant differences excepting the Coding subtest, on which the scaled scores of the WISC-R were significantly lower than WISC scaled scores ($p = 0.02$). He also found the variability in WISC-R Verbal I.Q. scores to be significantly greater than the variability in WISC Verbal I.Q. scores (p. iv). Interestingly, a similar study, conducted by Schwarting (1975) using repeated measures on 58 children, found Verbal, Performance, and Full Scale I.Q. scores to be significantly higher ($p = 0.0005$) on the WISC than on the WISC-R. He also found that nine out of the ten mandatory subtest mean scaled scores on the WISC were higher ($p = 0.05$) than the mean scaled scores of their counterparts on the WISC-R. These differences may be due to the different procedures employed in the two studies. While Schwarting used a single sample with repeated measures, Loewen obtained

his results from two independent samples, each being administered only one of the scales.

The WAIS and other Tests

Using the 1950 Census of the U.S., Wechsler stratified the standardization sample for the WAIS on seven variables: age, sex, geographic region, urban-rural residence, race, occupation, and education. Calculations based on the standardization sample of 1700 cases produced reliability coefficients for VIQ, PIQ, and FSIQ of .96, .93, and .97 respectively (Wechsler, 1955). These reliability coefficients were taken as an average of the reliabilities among three age groups.

In correlating the WAIS with the 1937 revision of the Stanford-Binet Intelligence Scale (S-B), Wechsler (1958) tested 52 reformatory inmates and obtained the following results: S-B x WAIS FSIQ 0.85; S-B x WAIS VIQ 0.80; S-B x WAIS PIQ 0.69 (p. 105).

Hall (1957) correlated a modified form of Raven's Progressive Matrices with the WAIS using 82 brain-damaged adult males, and obtained correlations of .58, .70, and .72 between Matrices and WAIS VIQ, PIQ, and FSIQ respectively. Watson and Klett (1974) also compared the WAIS with Raven's Progressive Matrices along with three other tests of intelligence - the Porteus Maze Test, the Cattell Culture Fair Test, and the D48 Test - using a sample of 120 psychiatric patients.

Out of these four tests, the only one that was reported to have correlated "quite low" with the WAIS was the Porteus Maze Test. The correlations of the other three tests with the WAIS were higher and similar in magnitude.

Comparisons between the WAIS and the Quick Test (QT), an individually administered test designed to provide a quick estimate of intelligence, has been the subject of other studies. Joesting and Joesting (1972) administered the WAIS and QT (Form 1) to 25 male and 20 female 16-56 year olds in the welfare departments of a southern U.S. state. QT I.Q.s and raw scores yielded significant ($p = 0.001$) correlations with all WAIS raw and scaled scores. Diener and Maroney (1974), using a sample of black male adolescent underachievers, reported multiple regressions of the combined three forms of the QT with the WAIS Verbal, Performance and Full Scale I.Q.s as being .66, .53, and .66 respectively.

In a comparison of the WAIS with the Slossen Intelligence Test (SIT), Carney and Karfgin (1971) reported that high correlations were calculated between SIT I.Q.s and the WAIS Full Scale and Verbal I.Q.s (range .865 - .960), with somewhat lower correlations between SIT I.Q.s and WAIS Performance I.Q.s (.528 - .649).

Finally, in a study to determine the relationship between the WAIS and the Peabody Picture Vocabulary Test (PPVT), Ernhart (1970) found that correlations of the PPVT and the WAIS Full Scale I.Q., Verbal I.Q. and Performance I.Q. were

.86, .88, and .75 respectively, in a sample of adult psychiatric patients.

By the extent of these studies, it is shown that the WAIS is a highly respected instrument which has become a standard by which other measures are now validated.

The WISC and the WAIS

Because of the limited amount of comparative research done using the WISC-R and the WAIS, several studies which report the relationship between the predecessor of the WISC-R, i.e. the WISC, and the WAIS shall be reported here.

Simpson (1974) assessed the comparability of the WISC and WAIS for below average intelligence subjects by administering the subtests of the two instruments in randomized order to 120 sixteen year old students. He found that the WAIS VIQs were higher than WISC VIQs (p less than 0.001); WAIS PIQs were higher than WISC PIQs (p less than 0.01); and that WAIS FSIQs were higher than WISC FSIQs (p less than 0.001). These results led to the conclusion that the WISC and the WAIS do not meet the statistical criteria of equivalence for students of less than average intelligence. Quereshi and Miller (1970) achieved similar results when they administered the WAIS, WISC, and Wechsler-Bellevue II to 72 randomly selected 17 year old high school students in order to investigate the scales' comparability. These results indicated that the subtest scores and I.Q.s for the

given three scales were not equivalent. Further evidence of the inequality of the scales comes from a study by Wesner (1973), who obtained WISC and WAIS scores from 51 adolescent subjects in an institution for the mentally retarded. The results of this study showed significantly higher WAIS Full Scale I.Q.s, but it was also noted that high correlations existed between the two scales. Hannon and Kicklighter (1970) administered the WAIS and WISC to 120 sixteen year old students and also found the WAIS to produce higher scores in the below average intelligence group. However, they found that with subjects of above average intelligence, the WISC yielded higher scores. Slightly different results were obtained by Allen (1973) when she extrapolated 15 year old norms for the WAIS and compared that scale to the WISC using a sample of 15 year old students. While the PIQs and FSIQs of the two scales remained significantly different ($p = 0.045$, $p = 0.007$ respectively) the VIQs did not.

On the other hand, Barclay, et al. (1969) compared a randomly selected sample of WISC subjects with a second group of randomly selected WAIS subjects. A comparison of the two groups failed to reveal any significant differences in their scores. However, caution must be exercised in examining these results, as no retest data are available on any of the subjects. Another study, conducted in 1967 by Ross and Morledge, compared the WISC and WAIS using thirty

subjects who were tested with the WISC at age 15 and then with the WAIS at age 16. The results yielded highly comparable I.Q.s, particularly for the Full Scale. Correlations for VIQ, PIQ, and FSIQ were .95, .92, and .96 respectively.

The WISC-R and the WAIS

As was previously mentioned in Chapter I, the only study which has been done, at this time, to compare the WISC-R with the WAIS was done by Wechsler in 1974. On a sample of forty subjects, aged 16 years, 11 months, correlations were calculated between each of the subtests of the WISC-R and the VIQ, PIQ, and FSIQ of the WAIS, in addition to correlations between the VIQs, PIQs and FSIQs of both scales. The latter three comparisons yielded correlations of .96, .83, and .95 respectively. As was also mentioned earlier, WAIS I.Q.s were about six points higher than those elicited by the WISC-R.

CHAPTER III

DESIGN OF THE STUDY

Subjects

The subjects in this study were drawn from various high schools within the Edmonton, and St. Albert, Alberta school jurisdictions. A total of thirty students, 13 male and 17 female, were administered the WAIS and the WISC-R. Eleven of the subjects were referred by their respective counselors who wished the scores to be made part of their permanent school records. The remaining nineteen subjects volunteered their time in return for being given a verbal interpretation of their test results. The examiner's only request to the school counselors was that the subjects' age be restricted to within the range 16-0-0 to 16-11-30. Consequently all thirty subjects met this requirement. Table 1 indicates the number of students by age.

Four out of the five high schools used in this study were standard composite high schools. One of the Edmonton Schools, W. P. Wagner, from which all subjects were referred by their counselor, was a vocational school having no university preparation program. Consequently the mean Full Scale I.Q. elicited from the subjects at this school was

Table 1

Number of Students by Age

Age years	Age months	Number of Students
16	0	2
16	1	2
16	2	1
16	3	3
16	4	5
16	5	1
16	6	4
16	7	7
16	8	2
16	9	1
16	10	1
16	11	1
Total		30

Mean age = 16-5.233

somewhat lower than the mean Full Scale I.Q.s found in the other four schools. Table 2 indicates the number of subjects by school.

Apparatus

As previously stated, the instruments chosen for this

Table 2

Number of Students by School
(I.Q.s also reported)

School	Number of Students	Mean I.Q.*
Ross Sheppard Composite H.S.	3	111.33
W. P. Wagner H.S.	7	95.71
St. Joseph's H.S.	8	103.50
St. Francis Xavier H.S.	6	113.08
Paul Kane H.S. (St. Albert)	6	112.83
	30	

* Average of WAIS and WISC-R FSIQs.

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study were the WISC-R and the WAIS. The eleven subtests being utilized on each of the instruments had mean scaled scores of ten and standard deviations of three. The VIQ, PIQ and FSIQ of both scales had means of one hundred and standard deviations of fifteen. These statistics were reported by Wechsler (1955, 1974).

Procedure

Both the WISC-R and the WAIS were administered to each of the thirty students by a qualified examiner. The tests were administered in a counterbalanced order, so as not to bias either of the scales with either a fatigue variable or a practice effect variable. All subjects were adminis-

tered the scales in a private office in their respective schools during normal school hours, and the periods between first and second testing were from two to eighteen hours. Each subject was administered both scales by the same examiner in order to insure consistence of scoring. Subtests on each of the scales were administered in the prescribed order, with the exception of the Mazes subtest on the WISC-R. This subtest was eliminated from the administrations as it is an optional subtest and has no effect on the I.Q. scores; and because it has no corresponding subtest on the WAIS to which it can be compared.

Treatment of the Data

Subtest scaled scores and VIQ, PIQ and FSIQ scores for both the WISC-R and the WAIS were correlated for the thirty subjects. The resulting fourteen-by-fourteen matrix included the following: WISC-R (Information, Comprehension, Arithmetic, Similarities, Digit Span, Vocabulary, Coding, Picture Completion, Block Design, Picture Arrangement, Object Assembly, Verbal I.Q., Performance I.Q., and Full Scale I.Q.); WAIS (Information, Comprehension, Arithmetic, Similarities, Digit Span, Vocabulary, Digit Symbol, Picture Completion, Block Design, Picture Arrangement, Object Assembly, Verbal I.Q., Performance I.Q., and Full Scale I.Q.). The correlation matrices provide information on between-test correlations and on within-test correlations.

To test for significant differences between the means of the two scales, the total data for Verbal Scale subtest scores, Performance Scale subtest scores and I.Q. scores on both scales were analyzed using a multi-variate statistical test - the one sample Hotelling T^2 test. This was followed by correlated t-tests for individual comparisons of the contrast of subtest means and VIQ, PIQ and FSIQ means to determine where differences existed between corresponding scores.

CHAPTER IV

ANALYSIS OF THE DATA

Analyses of the data were carried out as described in Chapter III. The first analysis of the data involved computation of the Pearson Product Moment Correlations between the scaled scores of (a) the subtests of the WISC-R and the WAIS, and (b) the VIQs, PIQs and FSIQs of the WISC-R and the WAIS. As an additional matter of interest, correlations were also obtained and reported between (c) each of the subtests of the WISC-R and the WAIS with the I.Q. scores of the opposing scale. The results of this analysis are reported in Table 3.

The second analysis of the data involved computation of Pearson Product Moment Correlations between the scaled scores of each of the subtests of the WISC-R with every other subtest of the WISC-R and also with the VIQs, PIQs and FSIQs obtained on the WISC-R. The results of this analysis are reported in Table 4. The third analysis includes the same correlations as those mentioned above being performed on WAIS subtests and I.Q.s, and these results are reported in Table 5.

In the final analysis, a one-sample Hotelling T^2 test was calculated to test for significant differences between

the WISC-R and the WAIS. In addition to this, individual comparisons were made using correlated t-tests between (a) each subtest on the WISC-R and its corresponding subtest on the WAIS, and (b) each of the I.Q.s (VIQ, PIQ and FSIQ) elicited by the WISC-R and their corresponding I.Q.s on the WAIS. The results of this analysis are reported in Table 6.

The null hypotheses for each comparison between the WISC-R and the WAIS are reported in this chapter. Following each table, the decisions as to whether to support or reject those hypotheses associated with it are reported. A level of significance of .05 was deemed necessary for the rejection of the null hypothesis.

Hypothesis Testing

Correlation coefficients between subtest scaled scores and I.Q.s on the WISC-R with subtest scaled scores and I.Q.s on the WAIS were obtained and reported in Table 3. Although the hypotheses stated below are concerned only with subtests and I.Q.s which correspond to one another on both scales, for the readers' interest, correlations between all subtest and I.Q. scores on the WISC-R with all subtest and I.Q. scores on the WAIS were reported. The results were used to support or reject the following null hypotheses which developed out of the aims of this study.

1. Scaled scores obtained on the Information subtest

of the WISC-R and on the Information subtest of the WAIS will have a correlation coefficient of zero.

2. Scaled scores obtained on the Comprehension subtest of the WISC-R and on the Comprehension subtest of the WAIS will have a correlation coefficient of zero.

3. Scaled scores obtained on the Arithmetic subtest of the WISC-R and on the Arithmetic subtest of the WAIS will have a correlation coefficient of zero.

4. Scaled scores obtained on the Similarities subtest of the WISC-R and on the Similarities subtest of the WAIS will have a correlation coefficient of zero.

5. Scaled scores obtained on the Digit Span subtest of the WISC-R and on the Digit Span subtest of the WAIS will have a correlation coefficient of zero.

6. Scaled scores obtained on the Vocabulary subtest of the WISC-R and on the Vocabulary subtest of the WAIS will have a correlation coefficient of zero.

7. Scaled scores obtained on the Coding subtest of the WISC-R and on the Digit Symbol subtest of the WAIS will have a correlation coefficient of zero.

8. Scaled scores obtained on the Picture Completion subtest of the WISC-R and on the Picture Completion subtest of the WAIS will have a correlation coefficient of zero.

9. Scaled scores obtained on the Block Design subtest

of the WISC-R and on the Block Design subtest of the WAIS will have a correlation coefficient of zero.

10. Scaled scores obtained on the Picture Arrangement subtest of the WISC-R and on the Picture Arrangement subtest of the WAIS will have a correlation coefficient of zero.

11. Scaled scores obtained on the Object Assembly subtest of the WISC-R and on the Object Assembly subtest of the WAIS will have a correlation coefficient of zero.

12. Verbal I.Q scores obtained on the WISC-R and Verbal I.Q. scores obtained on the WAIS will have a correlation coefficient of zero.

13. Performance I.Q. scores obtained on the WISC-R and Performance I.Q. scores obtained on the WAIS will have a correlation coefficient of zero.

14. Full Scale I.Q. scores obtained on the WISC-R and Full Scale I.Q. scores obtained on the WAIS will have a coefficient of zero.

The following key indicates the subtest which correspond to the number in Tables 3, 4, and 5.

WISC-R (Verbal Scale)		WAIS (Verbal Scale)	
1	Information	1	Information
2	Comprehension	2	Comprehension
3	Arithmetic	3	Arithmetic

WISC-R (Verbal Scale)		WAIS (Verbal Scale)	
4	Similarities	4	Similarities
5	Digit Span	5	Digit Span
6	Vocabulary	6	Vocabulary
	(Performance Scale)		(Performance Scale)
7	Coding	7	Digit Symbol
8	Picture Completion	8	Picture Completion
9	Block Design	9	Block Design
10	Picture Arrangement	10	Picture Arrangement
11	Object Assembly	11	Object Assembly

It is shown from the results reported in Table 3 that all hypotheses, excepting #8, were rejected at the .05 level of significance. The Verbal, Performance and Full Scale I.Q.s on the WISC-R correlated highly with those corresponding I.Q.s on the WAIS. The highest correlation was between the two Verbal Scale I.Q.s (.915). The magnitude and rank order of these correlations are consistent with values reported by Wechsler (1974).

Significant correlations ($p < .01$) were found between all the corresponding pairs of subtests excepting the Picture Completion subtests of both Scales ($p = .231$). The highest correlations were among subtests on the Verbal Scale

Table 3

Correlations between WISC-R and WAIS

	WAIS													
WISC-R	1	2	3	4	5	6	7	8	9	10	11	VIQ	PIQ	FSIQ
1	.919*	.687	.668	.632	.117	.777	-.023	.385	.328	.252	.318	.852	.358	.698
2	.579	.663*	.382	.539	.168	.729	.251	.318	.268	.319	.416	.697	.441	.650
3	.616	.415	.755*	.475	.161	.481	.149	.304	.333	.151	.264	.656	.299	.547
4	.613	.625	.446	.646*	.101	.818	.209	.351	.413	.389	.427	.699	.520	.689
5	-.035	.239	.163	.059	.724*	.213	.196	.320	.202	.138	.086	.253	.303	.305
6	.727	.763	.485	.704	.246	.927*	.110	.457	.530	.206	.448	.853	.498	.772
7	.191	.296	.345	.005	.143	.243	.820*	.365	.193	.271	.108	.294	.479	.402
8	.274	.350	.231	.328	-.075	.300	-.037	.226	.334	.271	.559	.322	.399	.387
9	.442	.545	.417	.317	.262	.567	.227	.586	.580*	.348	.603	.602	.627	.665
10	.048	.232	.278	.200	-.241	.031	.197	.194	.209	.569*	.424	.151	.439	.296
11	.342	.468	.467	.392	.217	.442	.228	.535	.557	.257	.650*	.543	.602	.611
VIQ	.868	.766	.678	.719	.162	.895	.183	.428	.439	.303	.430	.915*	.495	.806
PIQ	.398	.583	.529	.360	.110	.495	.477	.584	.585	.503	.702	.589	.783*	.727
FSIQ	.736	.787	.669	.646	.183	.807	.346	.576	.583	.451	.650	.872	.720	.880*

when $r \geq .463$, $p \leq .01$
$r \geq .361$, $p \leq .05$

* indicates corresponding subtest and I.Q. correlations that are significantly different from zero.

- Vocabulary and Information - and these correlations were .927 and .919 respectively. Although Wechsler (1974) does not report correlations between subtests on the WISC-R and WIAS, these findings are consistent with results reported by Allen (1973) in comparing the WISC with the WAIS (p. 22).

15. The relationships between subtest scores on the WISC-R will not differ significantly from the relationships between the respective WAIS subtest scores.

Tables 4 and 5 list the within-test correlations of the WISC-R and WAIS respectively. In order to determine whether these two correlation matrices differed significantly from one another, an asymptotic chi-square test for the equality of two correlation matrices, developed by Jennrich (1970), was utilized, and the following results were obtained: Chi square = 56.2; degress of freedom = 55; p = .436. From these results it was determined that hypothesis # 15 can be supported. Readers should regard these results with some caution, however, as the statistical test utilized here assumes two independent samples, and therefore will not elicit results as conservatively as a more appropriate statistical test would. Unfortunately, the writer was unable to locate any statistical test that would be totally appropriate for this problem.

Table 4

Within-Test Correlations - WISC-R Subtests

Subtests	1	2	3	4	5	6	7	8	9	10	11
2	.581										
3	.617	.269									
4	.671	.602	.322								
5	.039	.077	.272	.142							
6	.742	.694	.488	.788	.211						
7	.075	.250	.109	.267	.330	.189					
8	.278	.180	.449	.363	.012	.339	-.162				
9	.501	.419	.425	.508	.232	.529	.270	.291			
10	.115	.055	.126	.177	-.182	.008	-.014	.516	.176		
11	.398	.216	.523	.374	.142	.519	.163	.610	.713	.316	

Table 5

Within-Test Correlations - WAIS Subtests

Subtests	1	2	3	4	5	6	7	8	9	10	11
2	.732										
3	.637	.498									
4	.589	.580	.557								
5	.043	.239	.127	.208							
6	.710	.781	.535	.712	.198						
7	.060	.230	.454	.069	.047	.179					
8	.395	.513	.380	.451	.486	.425	.194				
9	.378	.446	.293	.518	.240	.440	.111	.598			
10	.211	.474	.384	.248	.029	.335	.293	.431	.133		
11	.299	.513	.295	.607	.257	.472	.231	.520	.717	.303	

16. Subjects' scores on the WISC-R and the WAIS will not differ significantly when compared over all subtest scores and I.Q. scores simultaneously.

In response to this hypothesis, a one-sample Hotelling T^2 test was computed on the thirty subjects in this study, over all subtest and I.Q. scores. The following results were obtained: $T^2 = 162.371$; degrees of $freedom_1 = 14$; degrees of $freedom_2 = 16$; F-ratio = 6.399; $p = 0.00035$. From these results it was determined that hypothesis #16 cannot be supported. Individual comparisons were therefore made using correlated t-tests, and the results of these tests are reported in Table 6.

On the basis of the results reported in Table 6, it appears that among those variables contributing most towards the rejection of hypothesis #16 are mean differences on the Information, Arithmetic, Similarities, and Digit Span subtests. These subtests are all included within the Verbal Scales of the WISC-R and the WAIS. In the cases of the Information and Comprehension subtests, the WISC-R means were shown to be significantly higher ($p < .05$) than the WAIS means, with the reverse being true in the cases of the Similarities and Digit Span subtests. It would also appear that mean differences between VIQs, PIQs and FSIQs on both scales were decisive contributing variables towards the rejection of the aforementioned hypothesis. The differences

Table 6

Means, Standard Deviations, t-values, and Probabilities of Differences between Means of Subtest Scaled Scores and I.Q.s on the WISC-R and WAIS

N = 30

SCALE	WISC-R mean	s	WAIS mean	s	t-value	p
Subtests						
Information	10.067	3.540	9.433	2.552	2.187	.0370
Comprehension	11.333	2.970	10.600	3.929	1.332	.1934
Arithmetic	11.100	3.048	10.100	2.761	2.628	.0136
Similarities	10.500	2.907	12.133	2.202	-3.921	.0005
Digit Span	9.333	2.737	10.067	2.159	-2.083	.0462
Vocabulary	9.667	2.737	9.833	2.672	-0.867	.3932
Coding/Digit Symbol	10.767	3.073	11.100	2.548	-1.021	.3155
Picture Completion	10.167	2.325	10.133	1.928	0.067	.9467
Block Design	10.900	2.785	11.300	2.597	-0.872	.3905
Picture Arrangement	10.667	2.521	10.733	2.449	-0.156	.8775
Object Assembly	11.333	3.155	10.700	3.398	1.240	.2249
I.Q.s						
Verbal	103.233	15.068	107.067	12.559	-3.328	.0024
Performance	104.800	12.600	107.667	12.051	-1.897	.0679
Full Scale	104.600	13.749	107.900	11.811	-2.714	.0111

between these means were 3.834, 2.867 and 3.300 respectively. It may be noted that the mean WAIS I.Q. was higher than the mean WISC-R I.Q. in all three comparisons.

Summary of the Results

Conclusions were drawn regarding the sixteen null hypotheses and results were obtained by computing (a) between-test correlations of the WISC-R and the WAIS, (b) within-test correlations of the WISC-R and the WAIS, and (c) a one sample Hotelling T^2 test to determine whether difference between the means of the WISC-R and the WAIS existed. Univariate t-tests were then computed to discover which of the variables contributed most to the mean difference between Scales. The results may be summarized as follows:

1. The correlations between all corresponding I.Q. scores and subtest scores, with the exception of the Picture Completion subtests, on the WISC-R and WAIS were positive and differed significantly from zero.

2. There is no significant difference between corresponding within-Scale relationships on the WISC-R and WAIS.

3. There is a significant difference between means on the WAIS and WISC-R when scores on the two scales are viewed simultaneously.

4. There is a significant difference between the Information, Arithmetic, Similarities and Digit Span subtests

on the WISC-R and corresponding subtests on the WAIS.

5. There is no significant difference between the Comprehension, Vocabulary, Coding (Digit Symbol), Picture Completion, Block Design, Picture Arrangement and Object Assembly subtests on the WISC-R and corresponding WAIS subtests.

6. There is a significant difference between the Verbal and Full Scale I.Q.s on the WISC-R and WAIS.

7. There is no significant difference between the Performance I.Q.s on the WISC-R and WAIS.

CHAPTER V

CONCLUSIONS AND IMPLICATIONS

The purpose of this study was to assess the comparability of the WAIS and the WISC-R over several dimensions - subtest and I.Q. means; correlations of corresponding subtest and I.Q. scores; and relationships of within-test correlation matrices. In order to make this assessment, thirty 16 year old high school students were tested with both instruments, and the following conclusions were reached by an analysis of their scores.

Conclusions

It seems evident, from the results of correlations between the WISC-R and the WAIS, and from comparisions of within-test correlations of the two Scales, that the instruments are highly related. A significant discrepancy between the corresponding VIQs and FSIQs of both Scales in favor of the WAIS indicates, however, that the IQ scores derived from both instruments cannot be deemed equivalent.

The t-tests for differences between subtest means showed WISC-R means to be significantly higher than WAIS means in two areas of the Verbal Scale - Information and Arithmetic, on which there were mean differences of .634 and 1.000 points respectively. On the other hand, WAIS means were signifi-

cantly higher than WISC-R means in two other areas of the Verbal Scale - Similarities and Digit Span, on which there were differences of 1.633 and .734 points respectively.

Correlations between corresponding subtests of the WISC-R and WAIS are generally high and significant beyond the .01 level. There is, however, some question regarding the insignificantly low correlation between the WISC-R and WAIS Picture Completion scores. It is suggested that this low correlation may be due to a number of variables involved in the two subtests. Firstly, the administration procedures for the two subtests are different in terms of their termination point. While the WAIS manual instructs the examiner to administer all items to the examinee regardless of the number of previous consecutively failed items, the WISC-R manual instructs the examiner to discontinue the test following four consecutive failures. Another variable on this subtest may have effected the results of the correlation due to the Canadian background of the subjects, i.e., on the WAIS there are two items - #11 and #13 - that are culturally biased in favor of U.S. subjects. The fact that one or both of these two items were failed by all but four of the thirty subjects may have been a contributing factor towards the low correlation arrived at. From these results it can only be assumed that these two subtests are not equivalent.

In terms of this study, the conclusions above seem to answer the questions put forth in Chapter I. It would seem feasible for a psychologist to administer either of the scales to a 16 year old subject, but it is recommended that the psychologist proceed with some caution when comparing the results of both scales on an individual or individuals. When using both scales in a test-retest situation, the psychologist should be aware that the WAIS may well result in a higher VIQ and FSIQ than the WISC-R; and when employing one of the Scales as a criterion measure, adjust the scores of the other Scale accordingly.

The results of this study also indicate that there has been a "growth in intelligence" of the 16 year old age group during the nineteen years between the norming of the WAIS and the WISC-R. This is due to the fact that this group is achieving higher scores on the WAIS, which was normed in 1955, than on the WISC-R, normed in 1974. This growth may be due to any given number of factors; however, the aim of this study is simply to document not why it exists, but whether it exists.

Implications for Further Research

In terms of further research, the following implications exist:

1. A larger sample of 16 year olds, drawn randomly from the total population, should be studied to determine whether the findings from this study are general.

2. Further studies incorporating the full intelligence range of the population would be wise to analyze both the high and low functioning subjects separately to determine the comparability of the WISC-R and WAIS for these groups.

3. Comparisons of the WISC-R and WAIS are necessary to determine whether the two Scales are related on factors other than scores. More specifically, are the two Scales related in terms of the clinical information they provide to psychologists?

4. Finally, an item analysis of Canadian subjects' responses should be carried out on the Picture Completion subtest of the WAIS to determine whether they are being unjustly penalized on this subtest due to culturally unfair items.

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APPENDIX A

Description of WISC-R and WAIS Subtests

APPENDIX A

Description of WISC-R and WAIS Subtests

WISC-R		WAIS
	Verbal Scale	
Information	Measures remote memory, intellectual curiosity, experiential and reading background, and general knowledge.	Information
Comprehension	Assesses the degree of social aculturation; largely dependent upon common sense.	Comprehension
Arithmetic	Measures auditory memory, numerical reasoning abilities, concentration. Scores may be adversely affected by anxiety.	Arithmetic
Similarities	Indicates level of awareness of relationships noted as concrete, functional or abstract.	Similarities
Digit Span	Measures the capacity to maintain, regenerate, and express the correct sequence of unstructured information.	Digit Span
Vocabulary	Measures expressive vocabulary and verbal fluency.	Vocabulary
	Performance Scale	
Coding	Involves the copying of unfamiliar, nonmeaningful symbols for familiar digits. Scores are influenced by visual memory, eye-hand coordination.	Coding
Picture Completion	Measures ability to note pertinent missing details. Scores may be affected by visual-perceptual deficit.	Picture Completion

WISC-R		WAIS
Block Design	Measures ability to analyze and reproduce abstract designs with blocks. Indicates level of nonverbal reasoning.	Block Design
Picture Arrangement	Measures ability to sequentially arrange pictures in a cause-effect relationship. Requires social awareness, noting of details, visual perception and common sense.	Picture Arrangement
Object Assembly	Measures how efficiently the subject can make meaningful juxtapositions of parts. Involves visual analysis and its coordination with simple assembly skills.	Object Assembly

APPENDIX B

Profile Sheets of WISC-R and WAIS

WISC-R RECORD FORM

Wechsler Intelligence Scale for Children—Revised

NAME _____ AGE _____ SEX _____

ADDRESS _____

PARENT'S NAME _____

SCHOOL _____ GRADE _____

PLACE OF TESTING _____ TESTED BY _____

REFERRED BY _____

WISC-R PROFILE

Clinicians who wish to draw a profile should first transfer the child's *scaled scores* to the row of boxes below. Then mark an X on the dot corresponding to the scaled score for each test, and draw a line connecting the X's.*

	VERBAL TESTS							PERFORMANCE TESTS						
	Information	Similarities	Arithmetic	Vocabulary	Comprehension	Digit Span		Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding	Mazes	
Scaled Score	☐	☐	☐	☐	☐	☐	Scaled Score	☐	☐	☐	☐	☐	☐	Scaled Score
19	•	•	•	•	•	•	19	•	•	•	•	•	•	19
18	•	•	•	•	•	•	18	•	•	•	•	•	•	18
17	•	•	•	•	•	•	17	•	•	•	•	•	•	17
16	•	•	•	•	•	•	16	•	•	•	•	•	•	16
15	•	•	•	•	•	•	15	•	•	•	•	•	•	15
14	•	•	•	•	•	•	14	•	•	•	•	•	•	14
13	•	•	•	•	•	•	13	•	•	•	•	•	•	13
12	•	•	•	•	•	•	12	•	•	•	•	•	•	12
11	•	•	•	•	•	•	11	•	•	•	•	•	•	11
10	•	•	•	•	•	•	10	•	•	•	•	•	•	10
9	•	•	•	•	•	•	9	•	•	•	•	•	•	9
8	•	•	•	•	•	•	8	•	•	•	•	•	•	8
7	•	•	•	•	•	•	7	•	•	•	•	•	•	7
6	•	•	•	•	•	•	6	•	•	•	•	•	•	6
5	•	•	•	•	•	•	5	•	•	•	•	•	•	5
4	•	•	•	•	•	•	4	•	•	•	•	•	•	4
3	•	•	•	•	•	•	3	•	•	•	•	•	•	3
2	•	•	•	•	•	•	2	•	•	•	•	•	•	2
1	•	•	•	•	•	•	1	•	•	•	•	•	•	1

*See Chapter 4 in the manual for a discussion of the significance of differences between scores on the tests.

NOTES

	Year	Month	Day
Date Tested			
Date of Birth			
Age			

	Raw Score	Scaled Score
VERBAL TESTS		
Information		
Similarities		
Arithmetic		
Vocabulary		
Comprehension		
(Digit Span)	( )	( )
Verbal Score		
PERFORMANCE TESTS		
Picture Completion		
Picture Arrangement		
Block Design		
Object Assembly		
Coding		
(Mazes)	( )	( )
Performance Score		

	Scaled Score	IQ
Verbal Score	*	
Performance Score	*	
Full Scale Score		

*Prorated from 4 tests, if necessary.

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WAIS RECORD FORM

Wechsler Adult Intelligence Scale

Name _____

Birth Date _____ (MO DAY YR.) Age _____ Sex _____ Marital: S M D W (CIRCLE ONE)

Nat. _____ Color _____ Tested by _____

Place of Examination _____ Date _____

Occupation _____ Education _____

TABLE OF SCALED SCORE EQUIVALENTS*

Scaled Score	RAW SCORE											Scaled Score
	Information	Comprehension	Arithmetic	Similarities	Digit Span	Vocabulary	Digit Symbol	Picture Completion	Block Design	Picture Arrangement	Object Assembly	
19	29	27-28		26	17	78-80	87-90					19
18	28	26		25		76-77	83-86	21		36	44	18
17	27	25	18	24		74-75	79-82		48	35	43	17
16	26	24	17	23	16	71-73	76-78	20	47	34	42	16
15	25	23	16	22	15	67-70	72-75		46	33	41	15
14	23-24	22	15	21	14	63-66	69-71	19	44-45	32	40	14
13	21-22	21	14	19-20		59-62	66-68	18	42-43	30-31	38-39	13
12	19-20	20	13	17-18	13	54-58	62-65	17	39-41	28-29	36-37	12
11	17-18	19	12	15-16	12	47-53	58-61	15-16	35-38	26-27	34-35	11
10	15-16	17-18	11	13-14	11	40-46	52-57	14	31-34	23-25	31-33	10
9	13-14	15-16	10	11-12	10	32-39	47-51	12-13	28-30	20-22	28-30	9
8	11-12	14	9	9-10		26-31	41-46	10-11	25-27	18-19	25-27	8
7	9-10	12-13	7-8	7-8	9	22-25	35-40	8-9	21-24	15-17	22-24	7
6	7-8	10-11	6	5-6	8	18-21	29-34	6-7	17-20	12-14	19-21	6
5	5-6	8-9	5	4		14-17	23-28	5	13-16	9-11	15-18	5
4	4	6-7	4	3	7	11-13	18-22	4	10-12	8	11-14	4
3	3	5	3	2		10	15-17	3	6-9	7	8-10	3
2	2	4	2	1	6	9	13-14	2	3-5	6	5-7	2
1	1	3	1		4-5	8	12	1	2	5	3-4	1
0	0	0-2	0	0	0-3	0-7	0-11	0	0-1	0-4	0-2	0

*Clinicians who wish to draw a "psychograph" on the above table may do so by connecting the subject's raw scores. The interpretation of any such profile, however, should take into account the reliabilities of the subtests and the lower reliabilities of *differences* between subtest scores.

SUMMARY

TEST	Raw Score	Scaled Score	
Information			
Comprehension			
Arithmetic			
Similarities			
Digit Span			
Vocabulary			
Verbal Score			
Digit Symbol			
Picture Completion			
Block Design			
Picture Arrangement			
Object Assembly			
Performance Score			
Total Score			

VERBAL SCORE _____ IQ _____

PERFORMANCE SCORE _____ IQ _____

FULL SCALE SCORE _____ IQ _____

1. INFORMATION	SCORE 1 or 0		SCORE 1 or 0		SCORE 1 or 0
1. Flag		11. Height		21. Senators	
2. Ball		12. Italy		22. Genesis	
3. Months		13. Clothes		23. Temperature	
4. Thermometer		14. Washington		24. Iliad	
5. Rubber		15. Hamlet		25. Blood vessels	
6. Presidents		16. Vatican		26. Koran	
7. Longfellow		17. Paris		27. Faust	
8. Weeks		18. Egypt		28. Ethnology	
9. Panama		19. Yeast		29. Apocrypha	
10. Brazil		20. Population			

OBSERVATIONS: